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EXAMINER	
NGUYEN, CHAU M	

ART UNIT	PAPER NUMBER
2633	3

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/931,331	STAPPAERTS, EDDY A.	
	Examiner	Art Unit	
	Chau M Nguyen	2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 August 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-52* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *36-41* is/are allowed.

6)☒ Claim(s) *1-35 and 42-52* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Durant et al. (hereinafter "Durant") (U.S. Pat. No. 6,016,212 B1).

As claims 1 and 21, Durant discloses an apparatus and method for optical communications (fig. 4) comprising:

means (100) for receiving an optical beam having a variable angle of incidence (col. 1, lines 57-59);

a diffraction grating (102) having a changeable configuration (through 110) for deflecting the optical beam to a fixed course relative to the receiving means (col. 4, lines 43-44); and

means (106) for detecting the optical beam after it has been deflected to the fixed course (col. 6, lines 44-46), whereby

the diffraction grating deflects the optical beam onto the fixed course independent of the angle of incidence (col. 4, lines 47-51).

3. Claims 1, 2, 3, 21 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Morioka et al. (hereinafter "Morioka") (U.S. Pat. No. 5,539,562).

As claims 1 and 21, Morioka discloses an apparatus and method for optical communications (fig. 21) comprising:

means (608) for receiving an optical beam having a variable angle of incidence (col. 28, lines 11-13);

a diffraction grating (524, detailed in fig. 17B, col. 25, lines 46-48) having a changeable configuration (through 611 & 617) for deflecting the optical beam to a fixed course relative to the receiving means (col. 28, lines 30-32); and

means (609) for detecting the optical beam after it has been deflected to the fixed course (col. 28, lines 15-18), whereby

the diffraction grating deflects the optical beam onto the fixed course independent of the angle of incidence (col. 25, line 66- col. 26, line 1).

As claims 2 and 22, the system of Morioka comprises a demodulator (218, col. 13, lines 46-47)) for demodulating the optical beam after it has been detected so that information transmitted therein is extracted.

As claim 3, although Morioka does not point out the diffraction grating deflecting the optical beam through a deflection angle proportional to the angle of incidence. Within the diffraction grating, the proportional relationship between the deflection angle and the angle of incident is an inherent characteristic (Bragg's Law).

4. Claims 26, 28, 34, 35, 42, 49, 50 are rejected under 35 U.S.C. 102(b) as being anticipated by Sharp et al. (hereinafter "Sharp") (U.S. Pat. No. 6,016,212 B1).

As claims 26 and 34, Sharp discloses a method of communicating that uses a laser beam comprising:

generating a conjugate beacon beam incident to a local oscillator beam at an angle of incidence relative thereto (col. 2, lines 30-42);

forming a hologram responsive to the angle of incidence (col. 3, lines 28-34 and col. 4, lines 17-19);

deflecting the laser beam through a deflection angle responsive to the hologram, to a fixed course relative to the local oscillator beam (col. 4, lines 17-19); and

detecting the deflected laser beam (col. 4, line 67-col. 5, lines 8).

As claim 28, Sharp discloses:

Writing a diffraction grating pattern responsive to the hologram on a spatial modulator (col. 3, lines 35-37); and

Applying the laser beam to the spatial light modulator (col. 3, lines 38-40);

As claim 35, although Morioka does not point out the diffraction grating deflecting the optical beam through a deflection angle proportional to the angle of incidence. Within the diffraction grating, the proportional relationship between the deflection angle and the angle of incident is an inherent characteristic (Bragg's Law).

As claim 42, Sharp discloses an apparatus for communicating through free-space (fig. 2), comprising:

a receiver (52) including a spatial light modulator (200) for emitting a beacon beam (col. 5, lines 39-42);

a transmitter (50) for forming a conjugate beacon beam responsive to the beacon beam, and also for transmitting the conjugate beacon beam and a communications beam carrying information across free-space (col. 5, lines 35-38 and col. 48-50);

the spatial light modulator also being for deflecting the communications beam to a predeterminable course; and

means for detecting the communications beam (24 and 28) aligned with the predeterminable course (col. 4, lines 14-21).

As claim 49, Sharp indicates the phase profile to be a quadratic phase profile (col. 5, lines 9-11 and col. 4, lines 64-66).

As claim 50, the modulator of Sharp has a spatial random phase pattern written thereon (Sharp, col. 4, lines 64-66). Sharp does not clearly show random pattern of 0 and Π phase values. However, in term of phase conjugation, it is inherently 180 degree different in phase.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 4 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morioka (U.S. Pat. No. 5,539,562), as applied to claim 1 above, and in view of Aprahamian et al. (hereinafter "Aprahamian") (U.S. Pat. No. 5,886,800).

As claims 4 and 23, Morioka fails to show the optical communication apparatus further comprising:

means that use a hologram for measuring the angle of incidence; and the configuration of the diffraction grating changing responsive to the holographic means.

However, Aprahamian discloses means that use a hologram for measuring the incident angle (col. 3, lines 4-10). Therefore, it would have been obvious to one having ordinary skill in the art to use holographic effect (caused by diffraction phenomenon) as taught by Aprahamian (Abstract) into the system (method) of Morioka in order to measure the aberration of the beam, and the course (direction) of the grating could be adjusted responsive to the holographic means. One would have motivated for doing this since the teaching of Aprahamian provides a simple devices for an automatic correction of phase aberrations and low cost (Aprahamian, col. 7, lines 21-27).

7. Claims 5 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morioka (U.S. Pat. No. 5,539,562), in view of Aprahamian (U.S. Pat. No. 5,886,800), as applied in the claim 4, and in further view of Sharp (U.S. Pat. No. 5,317,442).

As claim 5, the combination system Morioka and Aprahamian does not show the optical communication apparatus including:

the receiving means includes means for emitting a beacon beam so that the beacon beam intercepts a transmitter; and

the transmitter includes means for forming a conjugate beacon beam from the beacon beam, and means for transmitting the conjugate beacon beam to the receiving means.

However, Sharp (Abstract) discloses:

the receiving means (such as 53, fig. 2) includes means (23) for emitting a beacon beam so that the beacon beam intercepts a transmitter (col. 3, lines 61-65); and

the transmitter (such as 50) includes means (20) for forming a conjugate beacon beam from the beacon beam, and means (21) for transmitting the conjugate beacon beam to the receiving means (col. 3, line 66 – col. 4, lines 2).

Therefore, it would have been obvious to one having ordinary skill in the art to provide a means for emitting a beacon beam (at both receiving means and transmitting means) as taught by Sharp into the combination of Morioka and Aprahamian such that a two-way phase conjugation signal is established. One would have motivated for doing this since with the two (conjugated) signals provide real-time optical communication links to be established immediately with positive locational direction (Sharp, col. 2, lines 18-24).

As claim 15, Sharp shows the use of modulator having quadratic function (Sharp, col. 5, lines 9-11).

As claims 16 and 18, Sharp inherently shows modulator including diffraction grating (Sharp, col. 3, lines 10- 20).

As claim 17, the modulator of Sharp has a spatial random phase pattern written thereon (Sharp, col. 4, lines 64-66).

8. Claims 6-14, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morioka (U.S. Pat. No. 5,539,562), in view of Aprahamian (U.S. Pat. No. 5,886,800), in further view of Sharp (U.S. Pat. No. 5,317,442), as applied in the claim 5, an in further view of Davis et al. (hereinafter "Davis") (U.S. Pat. No. 5,166,507).

As claims 6 and 24, the system as combination system of Morioka, Aprahamian and Sharp, in that Aprahamian discloses (Aprahamian, fig. 1) :

the receiver also includes a reference laser 94 (local oscillator) for emitting a local (oscillator) beam;

the local (oscillator) beam and the image beam (conjugate beam) intersect at an angle proportional to the angle of incidence; and

the holographic means (104) is for interfering the local (oscillator) beam with the conjugate beacon beam to form the hologram, so that the hologram has a pattern responsive to the angle of incidence.

The combination system does not clearly show oscillator for emitting a local oscillator beam as cited in the claimed invention. However, Davis shows (receiver, left

side of fig. 2) a device (numerical 13) to be an oscillator for emitting a local oscillator beam (col. 3, lines 24-25 and lines 58-60).

Therefore, it would have been obvious to one having ordinary skill in the art to use a laser (including oscillator) as taught by Davis into the above combination system in order to generate a local oscillator beam. One having ordinary skill would have motivated for using an oscillator since it compensates the distortion that induced by the atmosphere (Davis, col. 3, lines 2-4).

As claim 7, from Aprahamian, fig. 1, the local beam (from laser 94) is parallel to the direction (fixed course) that directs into the hologram (104).

As claims 8 and 9, the detector of Morioka is an integrated detector array type (figs. 12, col. 3, lines 51-53), and it is used to generate a signal to control the wavefront alignment and therefore, the diffraction grating as well (see fig. 21).

As claims 10 and 25, Morioka discloses the use of an optical (spatial) filter. (col. 16, lines 60-64).

As claims 11, 12 and 13, Morioka, in the above combination system, discloses a filtered optical beam being emitted by the optical filter, detector, and demodulator as described above. Morioka does not disclose a high-speed detector, single-photon detector and/or demodulator means for quantum key distribution type(s) as cited in the claimed invention. However, it would have been obvious to one having ordinary skill in

the art at the time the invention was made to use any kind of detector in order to detect the incident beam, where the claimed differences involved to the substitution of interchangeable or replaceable equivalents and the reason for the selection of one equivalent for another was not to solve an existent problem, such substitution has been judicially determined to have been obvious. *In re Ruff, 118, USPQ, 343 (CCPA 1958).* This supporting is based on a recognition that the claimed difference exist not a result of an attempt by applicant to solve a problem but merely amounts to selection of expedients known to the artisan of ordinary skill as design choices.

As claim 14, Morioka discloses the use of heterodyne apparatus (col. 20, lines 32-35).

9. Claims 27 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sharp (U.S. Pat. No. 5,317,442), as applied in the claims 26 and 42, respectively, and in view of Davis (U.S. Pat. No. 5,166,507).

As claims 27 and 43, Sharp does not clearly show the local oscillator beam. However, Davis discloses a laser including oscillator (numerical 13, fig. 2) to be an oscillator for emitting a local oscillator beam (col. 3, lines 24-25 and lines 58-60).

Therefore, it would have been obvious to one having ordinary skill in the art to use a laser (including oscillator) as taught by Davis into the above combination system in order to generate a local oscillator beam and provide interference with the beacon beam.

One having ordinary skill would have motivated for using an oscillator since it compensates the distortion that induced by the atmosphere (Davis, col. 3, lines 2-4).

10. Claims 29-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sharp (U.S. Pat. No. 5,317,442), as applied in the claims 26 and 28, and in further view of Morioka (U.S. Pat. No. 5,539,562).

As claim 29, the system of Sharp does not show a step of aligning a spatial filter with the fixed direction (course) of the deflected laser beam. However, Morioka discloses an filter (col. 16, lines 60-64) that to be aligned with the fixed course of the deflected laser beam. Therefore, it would have been obvious to one having ordinary skill in the art to employ a filter and apply the method of alignment as taught by Morioka into the optic cal system of Sharp in order to direct the appropriate amount and direction of light into the detector. One would have motivated for doing this which is effective for improvement the signal-to-noise of the position detecting signal (Morioka, col. 16, lines 61-64).

As claim 30, the system of Morioka comprises a demodulator (218, col. 13, lines 46-47) for demodulating the optical beam after it has been detected so that information transmitted therein is extracted.

As claim 31, Sharp discloses the method comprising:

emitting a beacon beam having a phase profile;

intercepting a transmitting means with the beacon beam; and

generating the conjugate beacon beam with a conjugate phase profile derived from the phase profile of the beacon beam when the beacon beam intercepts the transmitting means (col. 2, lines 27-42).

As claims 32 and 33, Sharp indicates the phase profile to be a quadratic phase profile (col. 5, lines 9-11 and col. 4, lines 64-66). Morioka mentions the spherical wavelength of the beam (col. 2, lines 23-31).

11. Claims 44-47, 51 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sharp (U.S. Pat. No. 5,317,442), as applied in the claim 42, in view of Davis (U.S. Pat. No. 5,166,507), as applied in claim 43, and in further view of Morioka (U.S. Pat. No. 5,539,562).

As claim 44, the combination system of Sharp and Davis does not show a step of aligning a spatial filter with the fixed direction (course) of the deflected laser beam. However, Morioka discloses an filter (col. 16, lines 60-64) that to be aligned with the fixed course of the deflected laser beam. Therefore, it would have been obvious to one having ordinary skill in the art to employ a filter and apply the method of alignment as taught by Morioka into the optical system of Sharp and Davis in order to direct the appropriate amount and direction of light into the detector. One would have motivated for doing this which is effective for improvement the signal-to-noise of the position detecting signal (Morioka, col. 16, lines 61-64).

As claim 45, Morioka comprises a demodulator (218, col. 13, lines 46-47) for demodulating the optical beam after it has been detected so that information transmitted therein is extracted.

As claims 46 and 47, Sharp, in the above combination system, discloses a filtered optical beam being emitted by the optical filter, detector, and demodulator as described above. The combination does not disclose a high-speed detector and/or single-photon detector types as cited in the claimed invention. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use any kind of detector in order to detect the incident beam, where the claimed differences involved to the substitution of interchangeable or replaceable equivalents and the reason for the selection of one equivalent for another was not to solve an existent problem, such substitution has been judicially determined to have been obvious. *In re Ruff, 118, USPQ, 343 (CCPA 1958).* This supporting is based on a recognition that the claimed difference exist not a result of an attempt by applicant to solve a problem but merely amounts to selection of expedients known to the artisan of ordinary skill as design choices.

As claims 51 and 52, the combination of Sharp and Davis discloses the hologram is formed to detect the angle of incidence, and the incidence angle at the detector of the conjugate beacon beam is proportional to the (first) angle at the receiver. Sharp and Davis differs from the claimed invention, in that both Sharp and Davis does not clearly show the receiver including an integrating detector array and telescope for transforming the first angle of incidence into the second angle of incidence. However, Morioka

discloses receiver (211, fig. 3, col. 3, lines 51-53) including an integrating detector array for detecting the incident beam and adjusting the alignment based on the detecting signal, and housing (telescope) (119, fig. 1,col. 11, lines 52-59) for alignment the input beam to the detector. Therefore, it would have been obvious to one having ordinary skill in the art to use an integrating array detector and telescope as taught by Morioka into the combination system of Sharp and Davis in order to receive the beam signal. One having ordinary skill in the art would have motivated for doing this since integrating array detector provides more accuracy in detecting signal with the high speed (col. 14, lines 10-12).

12. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sharp (U.S. Pat. No. 5,317,442), as applied in the claim 42, in view of Davis (U.S. Pat. No. 5,166,507), and in view further of Morioka (U.S. Pat. No. 5,539,562).

As claim 48, Sharp discloses a detecting means as described above (in the rejection claim 42), in that Sharp does not clearly show a local oscillator. However, Davis discloses a laser including oscillator (numerical 13, fig. 2) to be an oscillator for emitting a local oscillator beam (col. 3, lines 24-25 and lines 58-60). The combination of Sharp and Davis still differs form the claimed invention wherein the detecting means comprising heterodyne apparatus. However, Morioka discloses the use of heterodyne apparatus (col. 20, lines 32-35). Therefore, it would have been obvious to one having ordinary skill in the art to use an oscillator as taught by Davis with heterodyne technique as mentioned by Morioka into the system of Sharp in order to emitting a heterodyne local oscillator beam.

One having ordinary skill in the art would have motivated for doing this since heterodyne method is characteristically less effected by incoherent light existing in the natural world, accordingly, it increases the transmission speed. (Morioka, col. 1, lines 24-29).

Claim Objections

13. Claims 19 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Allowable Subject Matter

14. Claims 36-41 are allowed.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Goodwill (U.S. Pat. No. 6,509,992 B1) is cited to show is cited to show free space optical interconnect system tolerant to misalignments and method of operation thereof.

Durant et al. (U.S. Pat. No. 6,016,212) is cited to show optical receiver for free space.

Finarov (U.S. Pat. No. 5,764,365) is cited to show two-dimensional beam detector.

Yang et al. (U.S. Pat. No. 6,704,509 B1) is cited to show is cited to show compact optical performance monitor.

MacGovern (U.S. Pat. No. 4,635,299) is cited to show discrete phase conjugate technique for precompensation of laser beams transmitted through turbulence.

Polynkin et al. (U.S. Pat. No. 6,507,685 B1) is cited to show method and apparatus for servo-based spectral array alignment in optical systems.

Shimonaka et al. (U.S. Pat. No. 5,548,434) is cited to show spatial light transmission apparatus.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chau M. Nguyen whose telephone number is 703-305-8965. The examiner can normally be reached on Mon-Fri from 8:00 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 703-305-4726. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

C.M.N.
Jun. 03, 2004

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